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Lehigh University Cognitive Science Program

CogSci News

Cognitive Science Program, Lehigh University, Bethlehem, PA 18015

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Editorial Policy

This newsletter is published twice each year, in fall and spring issues, by the Cognitive Science Program at Lehigh University. Its purpose is to inform faculty and students about the interdisciplinary and rapidly growing field of cognitive science and to report the activities of Lehigh's Program.

The newsletter is distributed free of charge in the United States and Canada to academic programs and individuals interested in cognitive science. Anyone who would like to be added to the mailing list should notify the Editor.

The Editorial Staff welcomes readers' comments and *solicits materials* dealing with cognitive science. We are especially pleased to consider course syllabi, book reviews, short essays, brief descriptions of scholarship and research in progress, and original art work (e.g., cartoons, line-drawings, computer-generated images).

Address all submissions, comments, and subscription requests to: John B. Gatewood, CogSci News, Price Hall #40, Lehigh University, Bethlehem, PA 18015. Electronic mail can be sent via Bitnet to jbg1@lehigh.

The Cognitive Science Community at UCSD

Donald A. Norman
Department of Cognitive Science
University of California, San Diego

Cognitive science has existed at the University of California, San Diego (UCSD) since the late 1970s, when we established a post-doctoral "Program in Cognitive Science" (funded by the Sloan Foundation) and the "Institute for Cognitive Science," which is an interdisciplinary research institute. This led us to host the founding meeting of the Cognitive Science Society (held at UCSD in 1979), marking cognitive science as an internationally visible enterprise. [These talks were subsequently published, jointly by Ablex and Erlbaum, as Norman, D. A., ed. (1981) *Perspectives on Cognitive Science*. Norwood, NJ: Ablex, and Hillsdale, NJ: Erlbaum.]

The ten-year period of the 1980s was a time of enormous excitement and intense activity as philosophers, linguists, psychologists, computer scientists, anthropologists, sociologists, and neuroscientists discovered in each other an interest in a common set of questions. What is the nature of intelligent activity? What are possible computational and biological mechanisms underlying such activity? What is the role of the environment—cultural and social as well as physical—in supporting and enabling cognition? How can complexity emerge from simple mechanisms? What is the role of learning, adaptation, and development in cognitive behavior?

These interactions led us to establish an interdisciplinary Ph.D. program and a cognitive science undergraduate major as part of the psychology department curriculum. Although these interdisciplinary programs were effective, the lack of formal departmental recognition meant that faculty could not devote full time to this enterprise, and it was not possible to devise cohesive, complete course sequences. Universities are built around departments, and unless a program is housed within a department, it is difficult or impossible to have a real, in-depth curriculum of study.

In 1986 we decided that the time was ripe for departmental status. After two years of effort, aided by considerable campus and administrative support, the department was formed and the first hiring of faculty began.

Today, in 1990, we have 14 faculty associated with the department, over 200 undergraduate majors, and around 20 full-time graduate students. We have moved into the "Cognitive Science Building," and we are rapidly expanding in terms of students, faculty, and laboratory facilities. The interdisciplinary aspects of cognitive science continue to flourish, and the participation of the broader cognitive science community on campus continues to be a strength of cognitive science as practiced at UCSD. The interdisciplinary Ph.D. program continues to be offered as a degree option (in addition to the departmental Ph.D.), with substantial participation by members of the Departments of Anthropology, Biology, Cognitive Science, Computer Science and Engineering, Linguistics, Neuroscience, Philosophy, Psychiatry, Psychology, and Sociology.

Besides the academic departments, the UCSD community includes a variety of research units with specific missions:

- *The Affiliates of Cognitive Science at UCSD*. A support group, formed

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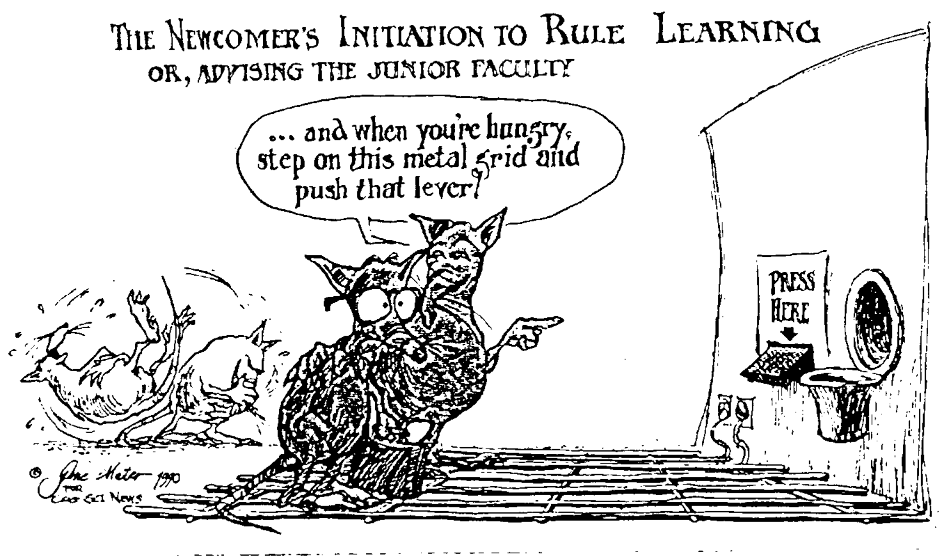
CogSci at UCSD (cont.)

in response to the interest shown in our research by industry and private agencies, provides a mechanism for supporting research in cognitive science and establishes a procedure for technology transfer.

- *The Center for Human Information Processing (CHIP).* One of the earliest cognitive science research centers in the country, research in CHIP focuses on mechanisms of information processing in humans.
- *The Center for Research in Language (CRL).* Research areas in CRL include cross-linguistic comparisons of language behavior; language development in children; PDP models of language processing; cognitive semantics; language universals; psycholinguistics; sign-language; and theoretical syntax, phonology, and semantics. CRL is the host for the Project in Cognitive and Neural Development.
- *The Institute for Neural Computation (INC).* The focus of INC is the study of neural-like computation in both biological and artificial systems. INC, together with the Department of Cognitive Science, sponsors the Connectionist Models Summer School. INC also administers the McDonnell-Pew Cognitive Neuroscience Center, which provides pre- and post-doctoral support to students of cognitive neuroscience.
- *The Laboratory of Comparative Human Cognition (LCHC).* Research in LCHC begins from the premise that the unique characteristic of human thought is that it is culturally mediated and constituted in socially organized activity. This assumption leads LCHC researchers to the analysis of concrete activity systems such as are found in work settings, schools, and various community institutions. It also leads them to the creation of model systems as a way of bridging theory and practice.
- *The Salk Institute.* Among many other areas, the Salk Institute houses research labs in neural computation, biological bases of language, and brain function.



by Gene Mater (Bethlehem, PA)

The Department of Cognitive Science

The Department of Cognitive Science emphasizes three main areas of study: the *brain*—a thorough understanding of neurobiological processes and phenomena; *behavior*—the experimental methods and findings from the study of psychology, language, and the sociocultural environment; and *computation*—the powers and limits of various representational formats coupled with studies of computational mechanisms. This approach involves a multidisciplinary study of cognition with emphasis on computer science, linguistics, neuroscience, psychology, and related elements from anthropology, biology, mathematics, philosophy, and sociology. Faculty in the department are:

Richard C. Atkinson (Chancellor); mathematical and cognitive psychology
Elizabeth Bates; psycholinguistics, language acquisition, aphasia
Aaron V. Cicourel; cognitive sociology, socialization, sociolinguistics, medical diagnostic reasoning
Jeffrey L. Elman (Director, Center for Research on Language); language processing, parallel distributed processing, computational linguistics, psycholinguistics
Gilles Fauconnier; language and cognition, semantic theory
Edwin L. Hutchins; culture, cognition, human-machine interfaces
David Kirsh; planning theories, foundations of artificial intelligence and cognitive science
Marta Kutas; brain processes of cognition, electrophysiology of language and comprehension
Jean M. Mandler; cognitive development
Helen Neville; human neuropsychology, biological foundations of language and other cognitive processes
Donald A. Norman (Chair); human memory, attention, and action; applications to design, the study of error, and human-machine interaction
Jaime A. Pineda; integration of neuroanatomical, neurochemical, and electrophysiological approaches to the study of behavior
Mark St. John; connectionist models of cognitive processes, language comprehension and learning, word problem comprehension and solving

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CogSci at UCSD (cont.)

Martin I. Sereno; neuroanatomy and neurophysiology of visual cortex, neural network models of motion processing

David Zipser; biologically plausible cognitive modeling

David E. Rumelhart (Adjunct); theory of representations, parallel distributed processing, neural networks

Terrence J. Sejnowski (Adjunct); computational neuroscience; the representation, transformation, and storage of information in the nervous system

At the undergraduate level, the department offers both a B.A. and a B.S. degree, and there is an honors program for exceptional students.

There are two Ph.D. programs, each with different admissions and graduation requirements. The Department of Cognitive Science offers a Ph.D. in cognitive science. In this option, students are admitted to UCSD directly into the department and fulfill degree requirements of the department. A second option is the interdisciplinary program, which offers a joint Ph.D. in cognitive science and a home department. Admission to UCSD, in this case, is through the home department, and students apply to the interdisciplinary program after they have completed a year of study (this is about to change—we are now considering allowing students to enter the interdisciplinary program at the time of admission to UCSD). In the interdisciplinary program, students must fulfill the requirements both of the home department and of the interdisciplinary program. Home departments are anthropology, computer science and engineering, linguistics, neurosciences, philosophy, psychology, and sociology.

Departmental Ph.D. in Cognitive Science

The department's full-time graduate program provides broad training in neurological processes and phenomena; experimental methods, results, and theories from the study of psychology, language, and social and cultural issues; and studies of computational mechanisms. The first year is devoted to familiarizing the student with the findings and current problems in cognitive science through foundations and issues courses. In the second year, basic courses and lab rotations are completed, but the major emphasis is on a year-long research project. At the end of spring quarter, the department gathers to hear the presentations of students' second-year research projects. There are frequent faculty-student interactions, including half-day meetings on some integrated theme, special lectures by the faculty or invited speakers, and the weekly Cognitive Science Seminar.

Formal Requirements

1. Foundations courses in the areas of brain, behavior, and computation (CogSci 201).
2. Completion of the study plan recommended by the student's advisor. The normal plan includes: (a) six approved issues courses, two each in the areas of brain, behavior, and computation, and (b) three, quarter- long laboratory rotations in different faculty laboratories.
3. Written and oral presentation of the second-year research project (CogSci 203 A-B-C).
4. Completion of the language requirement.
5. Three quarters of the Cognitive Science Seminar (CogSci 200) by the end of the second year, and participation thereafter encouraged.
6. Satisfactory completion of the qualifying paper.
7. At least three quarters of half-time teaching while in residence.
8. Active participation in departmental activities.
9. Completion of the Ph.D. dissertation and defense.

Admissions

The application deadline is January 15, and accepted applicants begin the program in the fall quarter of the same year. The admissions committee reviews each applicant's statement of purpose, letters of recommendation, GRE scores, previous education and work experience, and GPA, and then recommends candidates for admission to the entire faculty, who make the final decisions.

Interdisciplinary Ph.D. Program

The faculty of the interdisciplinary program consists of 45 individuals from 12 departments. There are four aspects to graduate study in the interdisciplinary program: (a) a primary specialization in one of the established disciplines of cognitive science; (b) a secondary specialization in a second field of study; (c) familiarity with general issues in the field and the various approaches taken to these issues by scholars in different disciplines; and (d) an original dissertation project of an interdisciplinary character. The degree itself reflects the interdisciplinary nature, being awarded jointly to the student for studies in the home department and cognitive science. Thus, students in linguistics will have degrees that read "Ph.D. in Linguistics and Cognitive Science" and the degrees of those in psychology will read "Ph.D. in Psychology and Cognitive Science."

Courses Offered

Undergraduate

10A-B-C. Minds, Brains, and Computers
101A-B-C. Fundamental Cognitive Phenomena
107A-B-C. Cognitive Neuroscience
108A. Modeling Cognitive Phenomena—Artificial Intelligence
108AL. Modeling Cognitive Phenomena Lab
108B. Modeling Cognitive Phenomena—Parallel Distributed Processing
108C. Parallel Distributed Processing Modeling
108D. Artificial Intelligence Modeling
113. Cognitive Development
130. Everyday Cognition
131. Distributed Cognition
132. Cognitive Engineering
141. Observation, Protocol, and Discourse Analysis
150. Semantics
153. Language Comprehension
170. Natural and Artificial Symbolic-Representational Systems
172. Brain Disorders and Cognition
190A-B-C. Projects in Cognitive Science
199. Special Project

Graduate

200. Cognitive Science Seminar
201. Proseminar
203A-B-C. Introduction to Research
211. Representation

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The Ethnographic Study of Cognitive Systems, II:

Conceptual Frameworks of Directional Orientation and Their Representations in the Physical World[1]

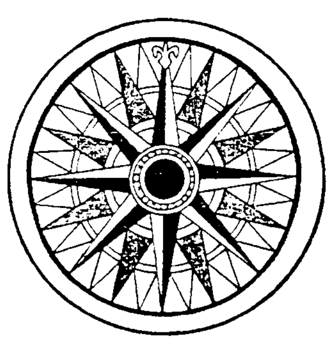
Charles O. Frake
Department of Anthropology
State University of New York, Buffalo

My title, "The Ethnographic Study of Cognitive Systems," is taken from that of a paper I wrote long ago at the outset of my academic career (Frake 1962). The "cognitive revolution" had just begun in linguistics and psychology. The birth of "cognitive science" was yet to come. At that time, to my audience of anthropologists, I could assume they all knew what an "ethnographic study" was, and they all believed in doing it. My task then was to explain and justify the study, any kind of study, of "cognitive systems." My argument then was that to do proper ethnography one had to attend to cognition.

Now, thirty years later, both the times and my audience are very different. I find myself addressing an audience of cognitive scientists who know very well what cognition is and who are devoted to its study. My task now is to explain and justify the "ethnographic study" part of my title. My argument now is that to do proper cognitive science one must accord a role to ethnographic investigation. One must, at least once in a while, abandon one's laboratories and computer screens, discard one's well-defined tasks, and go out into the real world to confront, as a quasi-participant, real people living their everyday lives in their own worlds. Ethnography is a very hard thing to do. It can be methodologically messy, socially embarrassing, psychologically upsetting, and physically dangerous. But it can also be tremendously revealing of the complex entanglements that enmesh the mind with the cultural, social, and physical worlds within which it works.

The original paper with this title dealt with problems of categorization, a topic now at the core of cognitive science. The research discussed here turns from ways of chunking up the world to ways of finding one's way around in it. My subject has been conceptual systems of directional orientation. Like most things that seem simple, directional systems, when investigated in the contexts of their actual use—i.e., investigated ethnographically—turn out to be surprisingly difficult to pin down. In the constraints of this short paper, I can only present some anecdotal illustrations of the major issues that this research addresses.

There are a variety of possible frameworks for directional systems. The principle distinction relevant to material at hand is between frameworks for what can be called *absolute* directions and those that are appropriately termed *contingent* directions. Absolute directions, like North-South-East-West, in contrast to contingent directional oppositions such as left-right, port-starboard, weather-lee, landward-seaward, and upstream-downstream, are construed as being external to the orienting body or boat and independent of geographical position, a fixed circle of directions that one moves through and turns around within. A system of absolute directions would appear to be more "abstract," more "context free" than other systems.



This may be so, but it does not at all follow that absolute schemes are restricted to the Western World or to "high" civilizations. Some non-Western cultures are, in fact, notorious for the, to us unusual, employment of absolute directions in microspace. Two island Southeast Asian examples are: "the east reel is turning faster than the west one" (a child watching a tape recorder playing inside a house at night); "secure that stay to the south outrigger boom" (order given on a sailboat at sea in the Sulu archipelago).[2] In judging whether a system is absolute, one should not be misled by the literal meaning of directional terms. Thus, in the nautical example above, what is given as "south" could more literally be rendered as "seaward" or "downhill" as opposed to "landward" or "uphill." Sometimes that is all it means, but when used in the absolute system, the "seaward" and "landward" axis is always at right angles to "east-west" axis, and the direction "seaward" need not point to the nearest "sea." At sea, surrounded by an island studded horizon, an environmental cue to the literal whereabouts of "seaward" or "downhill" is difficult to discern. This example points up the danger of confusing the name of a direction with the way in which a direction is found in a given case. There are a number of ways a Sulu sailor might discern where "seaward" lies, but whatever provides the cue, the direction is named "seaward." And it is always, conceptually, the same direction. There are a number of ways for a modern boy scout to find north, one of which is to look at a compass needle, another might be to search out the pole star, yet another to look for the proverbial moss on the tree trunk. None of these consistently point directly northward. They are only indicators of where north, a directional axis in a conceptual scheme, might lie. The compass needle, the pole star, and moss are physical

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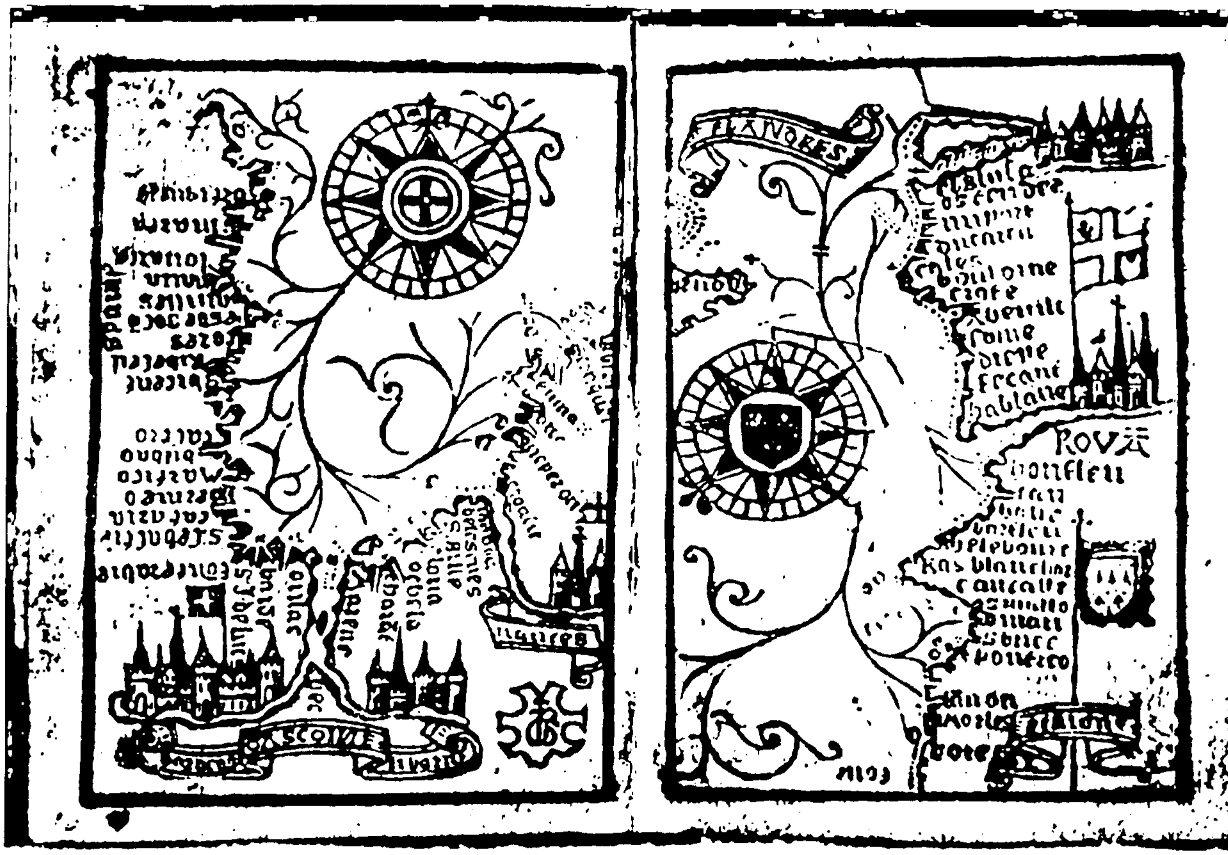

Ethnographic Study, II (cont.)

cues out there in the world. North is an idea—a concept—inside the head.

These anecdotes highlight a fundamental methodological problem: one cannot infer what kind of directional framework is being employed in a given case from the terminology of directions used; nor can one determine the direction being named from the literal meaning of a directional term. To know the direction, one must know the framework; to know the framework, one must know what people are doing in a given situation. To know that, we must go out into the real world and find people in the situations of their lives. We must, in short, do ethnography.

My current research compares navigational systems of seafarers in the Pacific, Island Southeast Asia, Indian Ocean, and medieval Europe (Frake 1985; 1990). In spite of very different cultural traditions, socio-economic contexts, technological embodiments, and maritime environments, basic structural similarities in directional frameworks seem to occur in all traditions. The problems encountered in uncovering these similarities point up several major issues of cognitive science. First, there is an issue which seems neither complex nor controversial in the abstract, but which causes surprising difficulties in the investigation of actual cases. That is, the relationship between the shape of a cognitive system and the shape of the physical cues in the external world that provide input to the operation of the system, a relationship confounded by the frequent appropriation, in human language, of nomenclatures applied to the physical world for mapping on to mental worlds.

The other related issue, an especially complex and thorny one, concerns the relationships among physical representations of cognitive systems in texts, diagrams, and instruments on the one hand and the form and workings of the cognitive systems they ostensibly represent on the other. Heated debates about the alleged impact of writing, of printing, of the clock, and now the computer on human thought are expressions of this issue. Perhaps the most important lesson of the research is that physical representations—verbal descriptions, written instructions, diagrams, charts, and instruments—are not only operational aids to the mind, but are, perhaps equally, public displays. Humans are not simply maximally (or minimally) efficient ecological adapters. Nor are they simply rational (or irrational) calculating machines. They are social animals with social aspirations of being accorded recognition and respect by their fellows and social fears of being confronted with rejection and humiliation. These social motivations shape the design and use of even the most obviously "practical" of behaviors and artifacts. Because of this, the complexity of a representation does not necessarily mirror the complexity of the system of knowledge that underlies the performance of the task for which the representation pertains. The navigation of Pacific islanders provides a telling demonstration that very complex systems of knowledge and thinking can have very meager physical manifestations in technology. Where

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Ethnographic Study, II (cont.)

physical depictions of the system come into play is not in the practice of navigation at sea, but in the teaching of it on land. Teaching is an occasion for the public display of knowledge. In that display, as well as in the display provided in late medieval and early renaissance Europe by maritime charts, navigation manuals, pilot books, almanacs, compasses, astrolabes, quadrants, and nocturnals, not only was knowledge being imparted and navigational practice facilitated, but also social status and cultural identity were being established. As a navigator, one must not only be able to find one's way at sea, one must also show the world that one is a navigator.

By observing the human mind at work within the cultural frameworks, social contexts, and task environments of the real world, cognitive anthropology treats cognition as a cultural and social as well as a psychological (or computational) phenomenon. Ironically, perhaps, in so doing it has revealed important universals in how the mind works across cultures and through human history. It promises to dissolve the imagined divide between our minds and the mind of "the other," between "us" and "them."

Notes

1. This article summarizes material presented in a talk to the Lehigh University Cognitive Science Program, October 11, 1990.
2. These examples are from fieldwork with the Yakan and Sama, Moslem peoples of the southwestern Philippines.

References

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Frake, C. (1985) Cognitive maps of time and tide among medieval seafarers. *Man*20:254-270.

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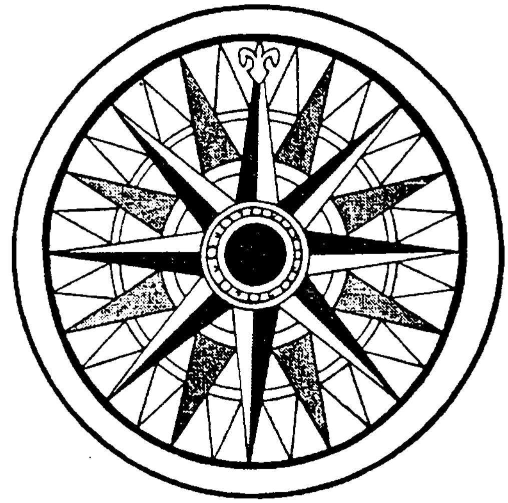
THE MEDIEVAL COMPASS AS A COGNITIVE SCHEMA FOR CALCULATING TIME AND TIDE



POINTS		TIME	POINTS		TIME
32	North	Midnight	16	South	Noon
1	N by E	0:45 AM	17	S by W	12:45 PM
2	NNE	1:30 AM	18	SSW	1:30 PM
3	NE by N	2:15 AM	19	SW by S	2:15 PM
4	NE	3:00 AM	20	SW	3:00 PM
5	NE by E	3:45 AM	21	SW by W	3:45 PM
6	ENE	4:30 AM	22	WSW	4:30 PM
7	E by N	5:15 AM	23	W by S	5:15 PM
8	East	6:00 AM	24	West	6:00 PM
9	E by S	6:45 AM	25	W by N	6:45 PM
10	ESE	7:30 AM	26	WNW	7:30 PM
11	SE by E	8:15 AM	27	NW by W	8:15 PM
12	SE	9:00 AM	28	NW	9:00 PM
13	SE by S	9:45 AM	29	NW by N	9:45 PM
14	SSE	10:30 AM	30	NNW	10:30 PM
15	S by E	11:15 AM	31	N by W	11:15 PM

CogSci at UCSD (cont.)

212. Theories of Learning
213. Issues in Cognitive Development
220. Complexity as an Emergent Property
231. Cognition and Action
234. Individual and Socially Distributed Cognition
251. Aphasia
253. Semantics and Cognition
254. Pragmatics and Common Sense Reasoning
261. Foundations of Cognitive Science
271. Biological Foundations of Language
272. Theoretical Neurobiology
273. Biological Basis of Attention
275. Visual Modeling
280. Seminar on Special Topics
281. Topics in Parallel Distributed Processing
282. Topics in Artificial Intelligence
283. Modeling Cognitive Phenomena
290. Cognitive Science Laboratory Rotation
298. Directed Independent Study
299. Thesis Research
500. Teaching Apprenticeship

For additional information, please contact Lynne Keith; Department of Cognitive Science D-015; University of California, San Diego; La Jolla, CA 92093; USA (bitnet: lkeith@ucsd , internet: lkeith@ucsd.edu).

Lehigh Events

24 September 1990
"A Case-Based Approach to Solving Real World Complex Problems: People and Machines Working Together Naturally"
Janet L. Kolodner
Georgia Institute of Technology

In case-based reasoning, new problems are solved by remembering (retrieving) previous problem situations similar to a new one and adapting retrieved solutions to fit the new problem. Case-based reasoning is useful for design tasks, planning, diagnosis problems, and common-sense problem solving. It is an inference method people use quite often in their day-to-day reasoning for both expert and commonsense tasks, and it provides an alternate way of building expert systems.

Research in automating case-based reasoning has focused mostly on retrieval and adaptation issues. Case-based systems have been developed that resolve arguments, create recipes, plan meals, design landscapes, configure machines, etc. Several systems are in use in industrial and military settings and are performing quite admirably.

The speaker first described case-based reasoning, spending the most time presenting case retrieval. Then she discussed what makes these systems work well and what is needed to extend them to work on more complex problems, concluding that they have to be made to work along with people to solve problems. Next, she explored people's capabilities to see if a match can be found, concluding that within the case-based paradigm, it makes sense to have the computer augment human memory by presenting the cases of others that can help a person make a decision. It then makes sense for the person to be responsible for reasoning based on those presented cases. Such systems are called case-based decision aiding systems. The speaker presented several idealized systems to illustrate the responsibilities of machines and people working together. Finally, she presented guidelines for building such systems and concluded by summarizing their potential benefits.

3 October 1990
"An Integration of Robotics and Artificial Intelligence"
Mark H. Bickhard
Lehigh University

Brooks, of the MIT robotics lab, suggests that representation is the wrong unit of abstraction for use in the construction of genuine intelligence. Artificial intelligence, meanwhile, has no principled solution to the empty symbol problem, also called the symbol grounding problem, and is forced to rely solely on a user and designer semantics. That is, artificial intelligence is unable to model representational content at the level of its foundational symbolic atoms, with a resultant "emptiness" and "lack of grounding" for its symbols—at all levels. The speaker argued that both of these positions stem from a common error regarding the nature of representation and suggested an alternative conception of representation that permits a natural interface between intelligent robots of the Brooks variety and the symbol manipulating powers of artificial intelligence.

16 October 1990
"Does Piagetian Class Inclusion Have Anything to Do with Mathematics?"
Robert L. Campbell
IBM Thomas J. Watson Research Center
Yorktown Heights, New York

The speaker presented an empirical study of the mathematical prerequisites (if any) for Piagetian class inclusion (the understanding that a superordinate class has at least as many members as any of its subclasses). Conceptual arguments show that non-Piagetian models of class inclusion require children to attempt solutions to the problem by counting, yet the empirical evidence is that most children attempt to solve the problem without counting. Such models can be eliminated from consideration, leaving two models within the Piagetian tradition.

The study used developmental sequence analysis to distinguish between these two models. Piaget's original model treats class inclusion as a logical inference about classes with minimal mathematical prerequisites (no counting needed, and only primitive addition and subtraction). A later Genevan model (proposed by Inhelder, Sinclair, and Bovet) claims that class inclusion incorporates the understanding that n members added to one subclass must be compensated by n members taken from another subclass for the number of superordinate class members to stay equal. This model requires knowledge of quantitative addition and subtraction and of additive composition of numbers for success on class-inclusion problems. Two classification tasks (class inclusion and class compensation) and two addition/subtraction tasks (quantitative addition/subtraction and additive composition) were given to 81 children between kindergarten and third grade.

Empirical ordering relationships among the tasks supported the old Piagetian model against the later Genevan model. Class inclusion indeed presupposes little knowledge of addition and subtraction. Taken together with prior evidence against the need for counting, the study shows little connection between class inclusion and early mathematical abilities.

While the speaker believes the logic of this study is unexceptionable, it has occasioned heated objections from some psychologists. The apparent reasons for these objections are:

(1) The belief that a psychological model consists only of the explicit statements of its proponents, and excludes unstated conclusions that can be deduced from it, especially if they apply to other tasks than those to which the model was originally applied.

(2) The belief that two tasks can be stipulated by "operational definition" to measure the same ability, and that neither rational debate nor empirical investigation of such questions is possible.

(3) The belief that empirical studies are a means of empirically confirming hypotheses, rather than a means of eliminating hypotheses by finding that empirical data falsify some of their consequences while leaving rival hypotheses unfalsified.

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Events (cont.)

26 October 1990
"The Adaptive Decision Maker: Process Models of Judgment and Choice"
Eric J. Johnson
The Wharton School
University of Pennsylvania

Studies of consumer choice reveal that decision-makers use many simplified strategies or heuristics in choosing alternatives. Using heuristics has consequences: they save considerable cognitive effort but at the risk of selecting inferior alternatives. The speaker described work that looks at how decision-makers make this tradeoff between the accuracy and effort of different choice strategies. It appears that decision-makers are adaptive to their task, and the accuracy and effort associated with choice heuristics can explain, in part at least, why certain heuristics will be used in different choice situations.

More recently, he and his colleagues have started to look at judgment processes, that is any task which requires respondents to generate a number such as a response on a scale or a forecast value. As in choice, there are many documented context effects. To illustrate, the speaker reported initial results concerning the impact of one heuristic, anchoring and adjustment, upon observed judgments.

8 November 1990
"Making a Science in Design"
John M. Carroll
IBM Thomas J. Watson Research Center
Yorktown Heights, New York

Over twenty years ago, Herbert Simon called for a "Science of Design," which he characterized as addressing a central problem in Psychology: "man's relation to the complex outer environment in which he seeks to survive and achieve." Today we still do not have a science of design, though in many design domains the need for such a science is more obvious and more acute than when Simon first identified it.

Many approaches to this problem have proven unsatisfactory both in failing to understand the "complex outer environment" (e.g., the so-called "new design methods" of the 1960s) and in failing to consider the interaction of humans with the environment (e.g., the "information processing" psychology of Simon and others). Paradoxically, it is precisely the difficulty of making a science of design that seems to drive theorists toward abstract methodological and empirical models, which in the end are too weak to capture anything of interest regarding design.

The speaker described a strongly bottom-up approach to this problem, which has been developed and applied in the design domain of human-computer interaction (HCI). His approach seeks to build a science of design by doing design, by reflecting upon what they create and self-consciously improving their own practice and by carefully abstracting their understanding as warranted. In assimilating design practice into their design analysis, he and his colleagues are trying to make a science in design.


(computerized image by Michael Keough)

This science takes seriously the complexity of the domain: user tasks and the signed artifacts. In the practice of the field, these objects already play important and effective roles. User task scenarios are simple and appropriate design representations, increasingly used to supplement or even replace traditional techniques for functional decomposition. They are also critical components of task-oriented instruction and other user support and of usability evaluation instruments.

Designed artifacts—hardware, systems, applications, interfaces—are also important objects in HCI, for they implicitly embody myriad psychological claims (e.g., what would have to be true of users if the artifact is usable?). Designers can clearly make use of this embodied psychology: new HCI systems often emulate momentous prior artifacts or directly synthesize aspects of several important precursors. The significant issues in HCI research are typically pursued and resolved through successive design and re-design of this sort. In this sense, HCI artifacts are the effective codifications of the theory in the field practiced.

The speaker and his research team at IBM are developing methods and tools to make tasks and artifacts even more generally and reliably useful as scientific abstractions. For example, the psychological import of an artifact can be more explicitly understood by interpretive analysis and empirical evaluation. This in turn can both enrich the science base of the field, via task and artifact abstractions, and can more ballistically guide the subsequent design of the user interaction scenarios for future HCI artifacts.

Simon's famous parable of the ant suggests that first-order regularities in behavior are frequently comprehensible only through reference to detail in the structure of the environment within which the behavior is produced. Following this reasoning, making a science in design may provide us with a useful blue-print for a more adequate science of psychology.

6 December 1990
"Recognition of Spoken Words with Ambiguous Word-Initial Phonemes"
Cynthia Connine
SUNY at Binghamton

The speaker described an experiment in which a cross-modal priming paradigm was used to investigate auditory word recognition under conditions of impoverished acoustic-phonetic information. Spoken words containing a word-initial ambiguous phoneme that resulted in a lexical ambiguity were embedded in sentence contexts. The results suggest that matching of acoustic-phonetic information to lexical representations in memory is based on goodness of fit. This conclusion was then discussed in terms of current models of auditory word recognition.

Meetings of Interest

F. J. Gall and S. Freud: An Historical Conference on Brain Functions

Next year will mark the 200th anniversary of Gall's first publication and the 100th anniversary of Freud's monograph on aphasia. This occasion has prompted an historical conference to discuss topics on the origins of psychology's disciplinary interests. The conference will be held from January 2-6, 1991, at the Ramada Inn in Fort Myers, Florida, USA. To receive information about or to register for the conference, contact:

Dr. Harry A. Whitaker
Department of Psychology
Univ. of Quebec at Montreal
C.P. 8888, Succ. A
Montreal, Quebec H3C 3P8
Canada
e-mail: r12040@uqam.bitnet

Conference on Artificial Intelligence Applications

The IEEE will hold its seventh annual Conference on Artificial Intelligence Applications at the Fontainbleau Hotel in Miami Beach, Florida, during the week of February 24th, 1991. The conference is devoted to the application of artificial intelligence techniques to real-world problems. Papers will discuss case studies of knowledge-based applications that solve significant problems and stimulate the development of useful techniques and also AI techniques and principles that underlie knowledge-based systems, and in turn, enable ever more ambitious real-world applications. For further information of the technical program, contact:

Tim Finin
Unisys Center for Advanced
Information Technology
70 East Swedesford Road
P.O. Box 517
Paoli, PA 19301
e-mail: finin@prc.unisys.com
phone: 215-648-2840

For registration and additional conference information, contact:

CAIA-91
The Computer Society of the IEEE
1730 Massachusetts Avenue, NW
Washington, DC 20036-1903
phone: 202-371-1013

TENNET II: Theoretical and Experimental Neuropsychology

TENNET II will be held May 8-10, 1991, at the University of Quebec at Montreal. Papers on all aspects of experimental and theoretical neuropsychology are welcome. The conference structure again will be (a) refereed submitted poster presentations and (b) invited or submitted thematic symposia of 2-3 hour duration. Both symposia and poster presentations will be concerned with contemporary topics and issues. For information on registration and hotel accommodations, please contact:

Dr. Harry A. Whitaker
Department of Psychology
Univ. of Quebec at Montreal
C.P. 8888, Succ. A
Montreal, Quebec H3C 3P8
Canada
e-mail: r12040@uqam.bitnet

Association for Computational Linguistics

The 29th annual meeting of the Association for Computational Linguistics will be held June 18-21, 1991, at the University of California, Berkeley. Original and unpublished papers are invited on all aspects of computational linguistics, including, but not limited to, pragmatics, discourse, semantics, syntax, and the lexicon; phonetics, phonology, and morphology; interpreting and generating the spoken and written language; linguistic, mathematical, and psychological models of language; machine translation and translation aids; natural language interfaces; message understanding systems; and theoretical and applications papers of every kind. Local arrangements are being handled by:

Peter Norvig and Robert Wilensky
Division of Computer Science
University of California
Berkeley, CA 94720
phones: (415) 642-9533 / 642-7034
e-mail1: norvig@teak.berkeley.edu
e-mail2: wilensky@teak.berkeley.edu

For other information on the conference and on the ACL more generally, contact:

Don Walker (ACL)
Bellcore, MRE 2A379
445 South Street
Box 1910
Morristown, NJ 07960-1910

9th National Conference on Artificial Intelligence

AAAI-91 will be held July 14-19, 1991, in Anaheim, California. The list of content areas includes: automated reasoning; cognitive modeling; distributed problem solving; education; enabling technology and systems; general knowledge representation; knowledge-based systems; machine learning; mathematical foundations; natural language; perception and signal understanding; planning, scheduling, and reasoning about action; reasoning about physical systems; robotics and control; and user interfaces. Submissions (6 hard copies) must be received by January 30, 1991. Send papers and conference registration inquiries to:

AAAI-90
American Association for Artificial
Intelligence
445 Burgess Drive
Menlo Park, CA 94025-3496

Cognitive Science Society

The 13th annual meeting of the Cognitive Science Society will be held August 7-10, 1991, at the University of Chicago. Areas of interest include: cognitive psychology, artificial intelligence, linguistics, philosophy of mind, cognitive anthropology, connectionist models, cognitive neuroscience, education, cognitive development, and philosophical foundations. Submit 5 copies of the papers by March 1, 1991, to: Cognitive Science 1991, Dept. of Computer Science, University of Chicago, 1100 East 58th Street, Chicago, IL 60637. For further information, contact:

Kristian Hammond
Department of Computer Science
University of Chicago
1100 East 58th Street
Chicago, IL 60637
or
Dedre Gentner
Department of Psychology
Northwestern University
Evanston, IL 60201

phone: (312) 702-1571
fax: (312) 702-8487
e-mail: cogsci91@
gargoyle.uchicago.edu

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Manuscripts or proposals for special issues in any area of artificial intelligence can be submitted to either the Editor:

Masoud Yazdani
Depaartment of Computer Science
Exeter University
Prince of Wales Road
Exeter EX4 4PT
United Kingdom
internet: masoud%cs.exeter.ac.uk
@cunyvm.cuny.edu

or to the Associate Editor:

Tim Finin
Unisys Center for Advanced Information Technology
70 East Swedesford Road
P.O. Box 517
Paoli, PA 19301
internet: finin@prc.unisys.com
phone: 215-648-2840
fax: 215-648-2288

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Cognitive Science Program
Lehigh University
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